

Appendix D

PLANNING and DESIGN GUIDE

APPENDIX D**PLANNING AND DESIGN GUIDE**

The following guide may be used as a check list to organize pipeline planning and design. It is particularly useful as an aid for those new to planning and designing livestock watering systems.

MISSOURI

Stockwater Pipeline and Tanks Planning and Design Guide

References

DETERMINE OPERATOR OBJECTIVES

Work with the operator to refine and define operator objectives before spending significant time on detailed planning.

RESOURCE INVENTORY

(May use Stockwater Pipeline Resource Inventory Worksheet, MO-ENG-103)

1. Annual grazing period.
2. Whether or not pipeline will need to operate in freezing weather.
3. Types and maximum number of livestock using system.
4. Type of grazing system to be used.
5. Define and measure area to be serviced by the pipeline.
6. Location and details of existing water sources in the area to be serviced by the pipeline.
7. Details concerning wells and pumps, including yield, condition, depth-to-water surface, and elevation.
8. Availability and cost of bringing in electric power.
9. Reliability and quality of existing water sources.
10. Water source that is proposed for use as supply for pipeline system.
11. Initial topographic information for the service area. This often can be accomplished by study of USGS Quadrangle maps, altimeter surveys, or aerial photos.
12. Geologic considerations which will effect pipeline route including location of shallow bedrock, unsuitable soils, coarse gravel subsoils, old slide areas, swampy areas, sharp breaks in the slope, etc.
13. Property line and ownership considerations which will effect the pipeline route.

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FOTG 556

14. Management factors:
 - How frequently are livestock checked?
 - Can livestock be quickly moved if the pipeline system fails?
15. Determine the user's desires concerning the system.
16. Site considerations:
 - Determine location and details of any buried or overhead utilities in the construction area.
 - Is the site within a flood plain?
 - Will wetlands be modified or disturbed by installing the project?
 - Make archaeological and historical resource survey, if one is required.

NEH 503.03

INTERPRETING, ANALYZING, AND EVALUATING

- 1 The pipeline and appurtenances will be planned as an integral part of a resource management system. Work with and educate the landuser to accomplish this.
2. Are there other alternatives to the proposed pipeline system? Can existing water sources be improved at less cost?
3. Are there soil or geologic conditions which will limit the type of pipeline system or how it is installed?
4. Are there labor, economic, management, or physical constraints on the system?
5. Is water source quality, timing and availability adequate?
6. Prepare a preliminary analysis of environmental effects.

DEVELOPING AND EVALUATING ALTERNATIVES

1. Determine minimum flow requirements during the period of peak stockwater use.
2. Determine desirable drinking tank locations. Standards set maximum distance between drinking locations.

FOTG 614
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MLWSH Ch. 2

FOTG 516

3.	Determine minimum water storage requirements.	FOTG 516 FOTG 614 MLWSH Ch. 8
4.	Determine drinking tank-type and capacity.	
5.	Determine storage tank-type and capacity.	MLWSH Ch. 8
6.	Based on all known factors, design the pipeline system alternative alignments.	MLWSH Ch. 9
7.	Type of system (automatic pressure, timed, gravity).	MLWSH Ch. 3
8.	Based on all available known factors, select a pipe-type and bury depth.	
9.	Preliminary design of pump and gravity inlet facilities.	MLWSH Ch. 8
9.	Preliminary design of drinking and storage tanks, including types, locations and preliminary sizes and elevations.	MLWSH Ch. 8
10.	Perform preliminary hydraulics to set size and grades. (SPIPE, IPIPE, or other approved computer programs may be used to aid with calculations.)	EFH Ch 3 MLWSH Ch 9 MSPM App B

MAKING DECISIONS AND DOCUMENTING

1. Present developed alternatives to the operator.
2. Make sure the operator has made a decision before proceeding.
3. Document decisions in SCS-CPA-6 planning notes and on the SCS-CPA-68 Record of Cooperator's Decisions.

IMPLEMENTING DECISIONS

Permits Make sure all required permits are obtained before proceeding with detailed design and layout.

1. Water right permits
2. Permits to cross State or Federal land and easements to cross private land.

Approval Authority

1. Determine approval authority for pipelines, tanks and other appurtenances.

NEM MO501.04
Individual

Collect Final Data for Design

1. Additional detailed engineering surveys which were not obtained during initial planning. A profile should be run just to the accuracy necessary for the particular installation. This may involve detailed bench level, transit, EDM, altimeter or simply a close study of 7-1/2 minute USGS maps, depending on the installation.

TR62
EFH Ch. 1
MLWSH Ch 4

System Design

1. Detailed hydraulics which were not done previously.
 - Pipeline hydraulics
(Can use SPIPE and IPIPE programs to aid in calc's)
2. Pressure tank size requirements
3. Pressure, surge and air control features
4. Pump size and pressure requirements
5. System accessory design
6. Quantity calculations (if needed for cost share, bidding or other reasons).
 - Schedule of pipe sizes, type and rating
 - Schedule of tank types, sizes and locations
 - Schedule of valve types and sizes

FOTG 516
MLWSH

EFH Ch 3
MLWSH Ch 9

MLWSH Ch 8

MLWSH Ch 6, 7

MLWSH Ch 8

MLWSH Ch. 8

Drawings and Specifications

1. Prepare drawings
 - Use standard drawings when possible.
 - Minimum drawings shall include:
 - Location map or enough description on plan view map to adequately locate job.
 - Plan view map showing location of all pipelines, tanks and water source.
 - Profiles along each pipeline. Show location of all appurtenances such as tanks, troughs, hydrants, valves, pressure reducers, etc.
 - Show elevations including water surface or starting pressure head, ground line, design hydraulic grade line, and static grade line.

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MO Std. Dwng.
& Spec. Handbook
NEM

- Table or drawing notes showing elevations, descriptions, dimensions and size of all structures, valves, special fittings and appurtenances.
- Standard details of tanks and pipeline.
- Special detail drawings of appurtenances not otherwise described.

2. Specifications

- Standard Missouri practice specifications shall be used to the maximum extent possible.
- Special provisions shall be prepared and made a part of the practice specifications when needed.

MO Std. Dwng
& Spec Handbook

Operation and Maintenance Plan

MLWSH Ch 11

- All important aspects of management and operation shall be documented in an operation and maintenance plan (O&M) and discussed with the operator.
- Maintenance recommendations shall be included in the O&M plan and discussed with the operator.

Layout

NEM 540
EFH Ch. 1
TR62

1. Set permanent bench marks (2 minimum).
 - Firmly set bench marks out of harms way
 - Clearly describe in notes
 - Show on drawings
2. Layout surveys shall be recorded in loose-leaf survey books or special forms and in accordance with TR62 and/or Chapter 1 of Engineering Field Handbook.

NEM 540
TR62
EFM Ch. 1

Compliance Checking

1. Adequate periodic inspection shall be scheduled and performed during construction. Frequent inspection during construction of stockwater pipelines cannot usually be performed by NRCS. We can make a point to view each contractor's work while the pipe is actually being laid at least once during the season. More frequent visits will be necessary if there are an unusual number of problems cropping up from job to job. We should provide enough inspection to assure ourselves that the pipe and tanks are being installed in accordance with the drawings and specifications.

NEM 512.33

Properly coached, the landuser can provide useful inspections during construction. Explain to the landuser what the drawings and specifications mean and what to look for as the job progresses.

2. As-built drawings should be prepared.

NEM 512.50

Complete documentation

The following documentation shall be in the case file:

1. Complete planner notes on Conservation Assistance Notes Form SCS-CPA-6. Documentation of operator decisions should be complete.
2. Original survey notes
3. Copy of all calculations, initialled and dated by the person doing the work and the person doing the checking.
4. Copy of all drawings
 - Signature of person with approval authority on first drawing
 - As-Built details noted on drawings
5. Specifications, either a copy of specifications or list of specifications with copy of signature sheet and special provisions.
6. Copy of sheet showing review of drawings and specifications by operator.
7. Copy of all statements relating to the completion check.
8. Where underground utilities are located in the construction area, a copy of completed Forms SCS-ENG-5 and SCS-ENG-6 must be in the file.
9. Copy of water rights or signed statement by producer that they are adequate.
10. Completed Environmental notes.
10. Cultural Resources Survey, if one is required.

References:

FOTG	NRCS Field Office Technical Guide: Missouri Practice Standards in FOTG Section IV.
NPM	NRCS National Planning Manual
NEM	NRCS National Engineering Manual
EFH	NRCS Engineering Field Handbook, Part 650
MLWSH	NRCS Missouri Livestock Watering Systems Handbook
NEH	NRCS National Engineering Handbook
TR62	NRCS Technical Release--Engineering Layout, Notes, Staking and Calculations
MSD&SH	NRCS Missouri Standard Drawings and Specifications Handbook